Xin Wang

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EDUCATION

01/2020 – 06/2024 Ph.D. in Civil Engineering, *University of Wisconsin-Madison*
GPA: 4.0 / 4.0

01/2020 – 05/2021 M.S. in Computer Science, *University of Wisconsin-Madison*
GPA: 4.0 / 4.0

09/2012 – 06/2019 M.S. and B.S. in Civil Engineering, *Tongji University*
GPA: 91.5 / 100 (M.S.), 4.74 / 5.0 (B.S.)

PROFESSIONAL POSITIONS

09/2024 – present Postdoctoral Researcher, *National Renewable Energy Laboratory* (*NREL*)

07/2024 – 09/2024 Postdoctoral Researcher, *University of Wisconsin-Madison* (*UW-Madison*)

RESEARCH INTERESTS

- Human-Robot Interaction
- Construction Automation and Robotics
- Artificial Intelligence in Construction
- Building Decarbonization and Resilience

RESEARCH EXPERIENCE

09/2024 – present Industrializing Construction to Decarbonize Buildings, *U.S. Department of Energy*

Advised by Naveen Kumar Muthumanickam and Shanti Pless, NREL

- Investigate the effects of different HVAC systems and their installation methods on the building energy performance.
- Integrate different data types (e.g., cameras, sensors) into one high-fidelity simulation model of the entire construction process.
- Utilize robotics technologies to reach out to hot and uncomfortable cavities for performing a variety of retrofit tasks in distinct building types.

01/2020 – 08/2024 Hand Gesture Recognition for Human-Robot Collaboration in Construction, *Wisconsin Alumni Research Foundation*

Advised by Prof. Dharmaraj Veeramani and Prof. Zhenhua Zhu, UW-Madison

- Proposed a vision-based framework including worker detection and tracking, frame cropping, and gesture recognition, to capture and interpret the hand gestures of construction workers.
- Developed a wearable sensor-based system including data preprocessing, window sliding and gesture recognition, to facilitate the accurate classification of hand gestures.
- Integrated eye tracking and hand gesture recognition for human-robot collaboration in construction.

06/2022 – 07/2022 Transformer-based Segmentation for Recycling Materials in Construction, *VIMS/IAARC Datathon 2022 Competition*

Advised by Prof. Yin Li and Prof. Zhenhua Zhu, UW-Madison

- Evaluated three state-of-the-art transformer-based architectures on construction image segmentation tasks.
- Established an ensemble model utilizing the techniques of model soup and probability weighting for

performance improvement.

09/2017 – 12/2019 Application of Information Technologies in Efficient Tunneling Boring Machine (TBM) Construction and Maintenance, *National Basic Research Program of China (973 Program)*

Advised by Prof. Hehua Zhu, Tongji University

- Utilized data mining methods including Long Short-Term Memory (LSTM) and clustering analysis to identify the different degradation patterns and predict the future performance of shield tunnels.
- Proposed an integrated data mining approach including data cleaning, partition of full tunneling cycles, feature extracting, and deep learning models, to perform real-time prediction of critical TBM operational parameters.

SELECTED JOURNAL PUBLICATIONS

Wang, X., Veeramani, D., Dai, F., Zhu, Z., 2024. Context-Aware Hand Gesture Interaction for Human-Robot Collaboration in Construction. Computer-Aided Civil and Infrastructure Engineering. DOI: 10.1111/mice.13202.

Wang, X., Han, W., Mo, S., Cai, T., Gong, Y., Li, Y., Zhu, Z., 2023. Transformer-Based Automated Segmentation of Recycling Materials for Semantic Understanding in Construction. Automation in Construction, DOI: 10.1016/j.autcon.2023.104983.

Wang, X., Han, W., Du, E., Dai, F., Zhu, Z., 2023. An Eye Gaze-Aided Virtual Tape Measure for Smart Construction. Canadian Journal of Civil Engineering, DOI: 10.1139/cjce-2023-0056.

Wang, X., Veeramani, D., Zhu, Z., 2023. Gaze-Aware Hand Gesture Recognition for Intelligent Construction. Engineering Applications of Artificial Intelligence, DOI: 10.1016/j.engappai.2023.106179.

Wang, X., Veeramani, D., Zhu, Z., 2022. Wearable Sensors-Based Hand Gesture Recognition for Human-Robot Collaboration in Construction. IEEE Sensors Journal, DOI: 10.1109/JSEN.2022.3222801.

Wang, X., Zhu, Z., 2021. Vision–Based Framework for Automatic Interpretation of Construction Workers' Hand Gestures. Automation in Construction, DOI: 10.1016/j.autcon.2021.103872.

Wang, X., Zhu, H., Zhu, M., Zhang, L., Ju, JW., 2021. An Integrated Parameter Prediction Framework for Intelligent TBM Excavation in Hard Rock. Tunneling and Underground Space Technology, DOI: 10.1016/j.tust.2021.104196.

Wang, X., Zhu, Z., 2021. Vision-based hand signal recognition in construction: A feasibility study. Automation in Construction, DOI: 10.1016/j.autcon.2021.103625.

Zhu, H., **Wang, X.**, Chen, X., Zhang, L., 2020. Similarity Search and Performance Prediction of Shield Tunnel in Operation Through Time Series Data Mining. Automation in Construction, DOI: 10.1016/j.autcon.2020.103178.

SELECTED CONFERENCE PUBLICATIONS

Wang, X., Veeramani, D., Dai, F., Zhu, Z. Eye Gaze and Hand Gesture-Driven Human-Robot Interaction in Construction. In: 2024 CI & CRC Joint Conference, Des Moines, Iowa, Mar. 20-23, 2024.

Wang, X., Han, W., Mo, S., Cai, T., Gong, Y., Li, Y., Zhu, Z. Transformer-Based Semantic Segmentation for Recycling Materials in Construction. In: 2023 ASCE International Conference on Computing in Civil Engineering, Corvallis, Oregon, Jun. 25-28, 2023.

Wang, X., Han, W., Du, E., Dai, F., Zhu, Z. An Eye Tracking Based Virtual Tape Measure in Construction. In: Transforming Construction with Reality Capture Technologies, Fredericton, New Brunswick, Canada, Aug. 23-25, 2022.

Wang, X., Veeramani, D., Zhu, Z. Integrated Sensor-Based Interface for Human-Robot Collaboration in Construction. In: 39th International Symposium on Automation and Robotics in Construction, Bogotá, Colombia, Jul. 13-15, 2022.

Wang, X., Zhu, Z. Vision-Based Recognition of Construction Worker's Hand Signals. In: CI & CRC Joint Conference, Arlington, Virginia, Mar. 9-12, 2022.

Wang, X., Zhu, Z. Wearable Sensor-based Hand Gesture Recognition of Construction Workers. In: 38th International

Symposium on Automation and Robotics in Construction, Dubai, UAE, Nov. 2-4, 2021.

Wang, X., Zhu, M., Shen Y. Prediction of TBM Operational Parameters Using an Integrated Data Mining Framework. In: Proceedings of 11th Asian Rock Mechanics Symposium, Beijing, China, Oct. 21-25, 2021.

Wang, X., Zhu, Z. Hand Signal Recognition of Workers on Construction Sites using Deep Learning Networks. In: International Conference on Computing in Civil Engineering, Orlando, FL., Sep. 12-14, 2021.

ACHIEVEMENTS AND AWARDS

Best Paper Award Across All Tracks (~ 400 Papers) in CI & CRC Joint Conference (2024). *American Society of Civil Engineers*.

Scholarship for Student Research Grants Competition - Conference Presentation (2023, 2021). *UW-Madison.*

Best Academic Paper Award in TCRC Conference (2022). *Canadian Society for Civil Engineering*.

First Place in VIMS/IAARC Datathon 2022 Competition (2022). *American Society of Civil Engineers*.

Awards of Outstanding Undergraduate Graduates (2016). *Tongji University*.

International Exchange Scholarship for Undergraduate Students (2016). *China Scholarship Council*.

National Scholarship for Undergraduate Students (2015). *Chinese Ministry of Education*.

Awards of Outstanding Undergraduate Students (2015). *Tongji University*.

First-class Academic Scholarship (2013, 2015). *Tongji University.*

Honorable Mention in American Mathematical Contest in Modeling (2015). *COMAP.*

Second Prize in China Undergraduate Mathematical Contest in Modeling (2014). *Chinese Ministry of Education*.

TEACHING EXPERIENCE

Independent Instructor for CEE 159 Civil Engineering Graphics (Spring 2024). *UW-Madison.*

Co-Instructor for CEE 669 Spatial/Visual Sensing Construction (Spring 2023). *UW-Madison.*

Teaching Assistant for CS 220/319 Data Programming I (Spring 2022). *UW-Madison.*

COMPUTER SKILLS

Programming Languages: C/C++, MATLAB, R, Python, SQL, GAMS

Deep Learning Libraries: Pytorch, TensorFlow, Keras, Numpy, OpenCV

Construction-Related Software: AutoCAD, Revit, ABAQUS, Primavera, WinEst